The Islamic University of Gaza
Faculty of Engineering
Design of Reinforced Concrete Structures II (ECIV 4316)
Midterm Examination (1st Semester, 2013-2014)

Instructor*:* Prof. Samir M. Shihada **Time***:* 70 Minutes

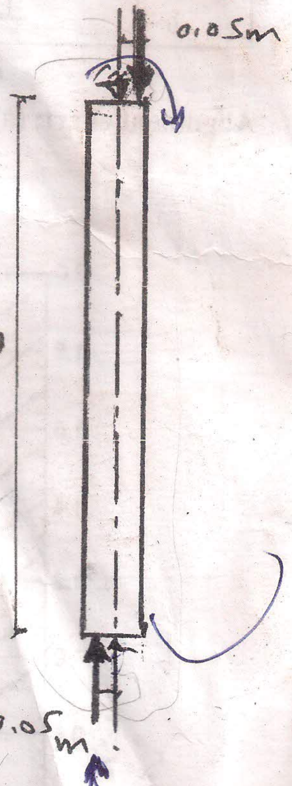
Notes:

1- **You may reasonably assume any missing data.**
2- **Base your design on ACI 318-08 or any subsequent versions.**

Problem (1):

A pinned-pinned column **6.0 m** in height supports a service dead load of **60 tons** and a service live load of **50 tons**. The loads are applied at eccentricities of **5.0 cm** at the top and the bottom of the column. The top eccentricity is situated to the right of the column centerline, while the bottom eccentricity is situated to its left. Design the column reinforcement knowing that its cross section is **50 cm x 50 cm** (neglecting its own weight).

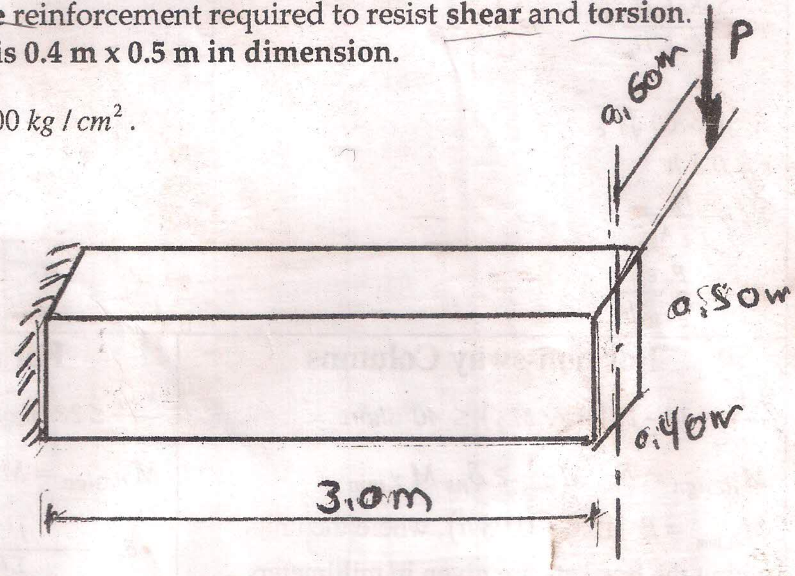
Use $f'_c = 280\ kg/cm^2$, $f_y = 4200\ kg/cm^2$.



Problem (2):

A cantilever beam **3.0-m** long supports its own weight plus a concentrated service dead load of **10** tons located **0.6 m** away from the vertical axis of the beam. Design the transverse reinforcement required to resist **shear** and **torsion**. **Note that the cross section is 0.4 m x 0.5 m in dimension.**

Use $f_c' = 280\ kg/cm^2$, $f_{yv} = 4200\ kg/cm^2$.



$$T_u \le \phi 0.27\, \lambda \sqrt{f_c'}\, \frac{(A_{cp}^2)}{p_{cp}}$$

$$V_n = V_c + V_s$$

$$V_c = 0.53\, \phi \sqrt{f_c'}\, b_w\, d$$

$$\frac{A_v}{S} = \frac{V_s}{f_{yt}\, d}$$

$$\frac{A_t}{S} = \frac{T_u}{2 A_o\, \phi\, f_{yt}}$$

$$A_o = 0.85\, A_{oh} = 0.85\, x_o\, y_o$$

$$(A_v + 2A_t) = \frac{0.2\sqrt{f_c'}\, b_w\, S}{f_{yt}} \ge \frac{3.5 b_w\, S}{f_{yt}}$$